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The genus *Psilocybe* in Italy

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Abstract

In the absence of specific studies on the *Psilocybe* genus in Italy, we provide information on the taxonomy, habitat, ecology, and distribution of the nine taxa currently recorded for Italy. A nomenclatural update of *Psilocybe* taxa reported in the Checklist of Italian Fungi (Basidiomycetes), published in 2005, is provided and seven scientific binomials are confirmed. In addition, *P. medullosa* and *P. serbica*, recently found in Trentino-Alto Adige/ Südtirol and Calabria respectively, are added to the list of taxa of the genus *Psilocybe* in Italy. Data on distribution and ecological categories of each taxon are also reported together with a molecular analysis. Considering how easily *Psilocybe* species can be found in Italy and their psilocybin and psilocin content, the authors hope that Italy will also legalize the use of psychedelic mushrooms in clinical therapies, as already permitted in many other countries.

Keywords

Basidiomycetes, Habitat, Hymenogastraceae, Italy, Psilocybin fungi, Taxonomy

Introduction

Since ancient times, humans have come into contact with psychedelic substances found in certain species of mushrooms. Very well-known are the depictions in Stone Age rock art in Africa and Europe as well as the sculptures in the pre-Columbian

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glyphs seen throughout the Americas (Gjerde 2024), Australia, and Mexico (Pepe et al. 2023). Psilocybin mushrooms are hallucinogenic mushrooms that contain psilocybin (4-phosphoryloxy-N, N-dimethyltryptamine), a natural occurring tryptamine alkaloid. Following oral ingestion, psilocybin is rapidly dephosphorylated via the acidic environment of the stomach into psilocin. Any remaining psilocybin is then converted in the gut, blood, and kidneys through alkaline phosphatase to produce the active, lipophilic form, psilocin (MacCallum et al. 2002; Passie et al. 2002).

The genus *Psilocybe* (Fr.) P.Kumm. (Hymenogastraceae, Basidiomycetes) was described by Fries (1794–1878) as a group of the *Pratella* Fr. series within his vast genus *Agaricus* L. It was later elevated to the rank of genus Kummer (1871) where it included many species that are no longer classified within the genus. More recently, elucidation of the psilocybin biosynthetic gene cluster and studies on the taxonomy, molecular systematics and ecology of the genus *Psilocybe* has overcome the traditional separation of the species into two groups (psilocybin-active and psilocybin-inactive) emphasizing that the genus *Psilocybe sensu strictu* includes over 150 species distributed throughout the world, and that the type species is *Psilocybe semilanceata* (Fr.) P.Kumm. (Guzmán 1983).

Members of genus *Psilocybe* have different contents of psilocybin, but this prodrug can also be found in many other genera, namely *Conocybe* Fayod, *Galerina* Earle, *Hypholoma* (Fr.) P.Kumm., *Inocybe* (Fr.) Fr., *Gymnopilus* P.Karst., *Panaeolina* Maire, *Panaeolus* (Fr.) Quél., *Pholiotina* Fayod, and *Pluteus* Fr., with psilocybin content ranging from 0.16 to 1.78 % and of psilocin from 0.01 to 0.59 %, on dry mushroom weight (Tylš et al. 2014).

The greatest species diversity of genus *Psilocybe* is found in the neotropics, from Mesoamerica through to Brazil and Chile (Guzmán et al. 1998). Mexico possesses the highest number of taxa (53) followed by Canada and the USA with 22 taxa. In Europe, only 16 taxa have been recorded to date, while 15 are reported from Asia, 4 from Africa and Australia, respectively, and 19 from Easter Island (Chile). As regards distribution, there are some similarities between regions, in fact *P. cubensis* (Earle) Singer and *P. subcubensis* Guzmán are reported throughout the tropics, *P. argentina* (Speg.) Singer in several high mountains, in the Austral and Boreal regions; and *P. fimetaria* (P.D.Orton) Watling and *P. semilanceata* (Fr.) P.Kumm. in Europe, Canada, and the USA (Guzmán 2005).

Psilocybe species are small in size, with a fimicolous growth habitat, on fertilized soil or on mosses. The cap varies from hemispherical to conical-bell-shaped, viscous in some species and with flaky residues of the general veil. The stem is slender and longer than the diameter of the cap, flaky in some species, with a fleeting ring or without one. The basidiospores are smooth, with an evident germinative pore. The color of basidiospores in mass is brown-purple or brown-purplish or blackish purple (Nashikkar et al. 2024). Some *Psilocybe* species instantly develop an intense blue color when scratched (Lenz et al. 2019).

The bluish coloration of basidiomata after rubbing as in the case of *Psilocybe azurescens* Stamets & Gartz, *P. cubensis* (Earle) Singer, and *P. semilanceata* (Fr.) P.Kumm. is a fundamental characteristic that historically defined one of the two main lineages (blue-staining and non-bluing species) within the genus before it was reclassified (Bradshawa

et al. 2024). Among the European species of *Psilocybe* only a few shows bluish discolorations and are considered hallucinogenic, such as *P. cyanescens* Wakef., *P. semilanceata* var. *caerulescens* (Cooke) Sacc., *P. serbica* Moser & Horak, *P. fimetaria* (P.D.Orton) Watling, and *P. liniformans* Guzmán & Bas.

A very limited number of studies on the distribution and ecology of *Psilocybe* species are reported from Italy. The habitat and distribution of two species, *Psilocybe semilanceata* and *P. serbica* M.M.Moser & E.Horak, were recently characterized (Samorini 1992; Valletta 2023), and *P. medullosa* (Bres.) Borov. was reported in a conifer forest of northern Italy (Voto 2017).

The study of psilocybin mushrooms and their applications in medicine is booming worldwide (Griffiths 2016; Ziff et al. 2022; Spiers et al. 2024). In Italy, the cultivation and trade of hallucinogenic mushrooms is currently illegal. Psilocybin, considered a narcotic substance, is listed in the table of narcotic and psychotropic substances of the Italian Ministry of Health, even though it is not addictive and has low toxicity (https://www.salute.gov.it/new/it/tema/medicinali-stupefacenti-e-precursori-di-droghe/). In 2025, the Italian Drug Agency (AIFA) authorized the first clinical trial in Italy, at a hospital in Chieti (Abruzzo, central Italy), involving 68 patients suffering from depression.

In the absence of specific studies on the *Psilocybe* genus in Italy, we provide information on the taxonomy, habitat, ecology, and distribution of the nine taxa currently known to grow in Italy.

Materials and methods

Macro- and micro-morphological analyses

Based on literature and field data, nine species of *Psilocybe* have been recorded in Italy. In particular, we refer to the Checklist of Italian Fungi (Basidiomycetes) (Onofri et al. 2005) to provide a nomenclatural update and for finding herbarium specimens useful for characterization of the macro- and micro-morphological features, distribution data, and for molecular analysis of *Psilocybe aurantiaca* (Cooke) Noordel., *P. cyanescens*, *P. semilanceata*, *P. semistriata* (Peck) Guzmán, *P. subcoprophila* (Britzelm.) Sacc., *P. subviscida* (Peck) Kauffman, and *P. turficola* J.Favre. Herbarium specimens of the species listed above were requested on loan from the herbaria (acronyms follow Thiers 2025) CAT and PI (*P. aurantiaca*), CAT and GE (*P. cyanescens*), CAT and MOD (*P. semilanceata*), AMB (*P. semistriata*, *P. subcoprophila*), HUBO (*P. subviscida*), and MCVE (*P. turficola*). On the contrary, new collections of *P. medullosa* and *P. serbica* previously recorded in Italy (Samorini 1992; Voto 2017; Valletta 2023), were obtained by us in autumn and spring 2024, from conifer forests in the Paneveggio Pale di S. Martino Regional Park (province of Trento, Trentino Alto Adige) and in the conifer forests of the Sila National Park (province of Cosenza, Calabria), in the framework of the activities of the Network for the Study of Mycological Diversity (NDM) sponsored by the Italian Institute for Environmental Protection and Research (ISPRA). Species collected

in the wild were wrapped in aluminum foil and then transferred to the mycology lab of the Department of Agricultural, Food, and Forest Sciences (SAAF) of the University of Palermo, for micromorphological examination. For each taxon, we analyzed macroscopic features (pileus, flesh, lamellae, stipe, type of habit: solitary, grouped, clustered, cespitose, color of spore, etc.), microscopic characters (spores, basidia, cystidia, element of the stipe surface, etc.), and analytical keys related to the genus *Psilocybe* (Stamets and Weil 1996). Colors refer to the RAL matching system (RAL is a color matching system that defines colors for paints, coatings, and plastics; the RAL standard is managed by the RAL Deutsches Institut für Gütesicherung und Kennzeichnung, based in Bonn, Germany). The dried specimens, prepared in a universal dryer 475-Watt stainless steel structure with five baskets, are deposited in the herbarium SAF of the University of Palermo (SAF 1003, 1004). The nomenclature of *Psilocybe* taxa mostly follows Index Fungorum; however, considering the nomenclatural problems in the genus, the similar morphology of some species, and the variable presence of key characteristics like blue staining, we referred to the most recent phylogenetic and chemical studies (Lenz et al. 2019) or other manuscripts dealing with the systematics of psilocybin-producing taxa (Valletta 2023 Bradshawa et al. 2024).

Molecular identification

DNA was extracted from dried *Psilocybe* samples using the Extract-N-Amp kit (Sigma-Aldrich, St. Louis, USA) following the manufacturer's instructions. DNA purity and concentration were measured using the NanoDrop ND-1000 spectrophotometer (Thermo Fisher Scientific, Waltham, USA) at 260/280 nm and 260/230 nm. ITS1/ITS4 primers were used to amplify the internal transcribed spacer region of rDNA (ITS) by polymerase chain reaction (PCR). The PCR mix consisted in a total reaction volume of 20 µL containing 4 µL of extracted DNA, 10 µL of the Extract-N-Amp PCR reaction mix (Sigma-Aldrich, St. Louis, USA), 1 µL of each primer at 10 µM and 4 µL of sterilized distilled water. The amplification was carried out in a MultiGene OptiMax thermocycler (Labnet International Inc.) with an initial denaturation cycle at 94 °C for 3 min, followed by 35 cycles at 94 °C for 30 s, annealing at 55 °C for 30s, elongation at 72 °C for 45 s and a final extension at 72 °C for 10 min. PCR product was separated by electrophoresis in 1.5% agarose gel and detected under UV transilluminator. PCR product was purified following the Exo I-SAP protocol according to the manufacturer's instructions (Applied Biosystems, Foster City, CA) and then sent to BMR Genomics (Padova, Italy) for sequencing. The obtained sequence was manually adjusted when needed and compared with those reported in GenBank through BLASTn tool (https://blast.ncbi.nlm.nih.gov). The new sequence was deposited in GenBank. Sequence with 100% similarity, as well as representative sequences of *Psilocybe* sp. pl. were retrieved from GenBank and aligned with our sequences. Alignments were made using ClustalW tool and a molecular analysis was performed using the Maximum Likelihood method and the Tamura-Nei model. MEGA12 software was used both for alignment and molecular analysis. Confidence values for individual branches were determined by the bootstrap test (1,000 replicates).

Results

Diversity of *Psilocybe* taxa in Italy

A list of 40 psychedelic fungal taxa (36 species and 4 varieties) has been reported (Table 1).

Table 1. Nomenclatural update of *Psilocybe* taxa reported in the Checklist of Italian Fungi (Basidiomycetes) (Onofri et al. 2005). The new binomials refer to Index Fungorum (November 2025).

Taxon	Nomenclatural update	Family
Psilocybe aeruginosa (M.A.Curtis) Nooderl.	*Stropharia aeruginosa* (Curtis) Quél.	Strophariaceae
Psilocybe albonitens (Fr.) Noordel.	*Stropharia albonitens* (Fr.) Quél.	Strophariaceae
Psilocybe aurantiaca (Cooke) Noordel.	Binomial confirmed	Hymenogastraceae
Psilocybe caerulea (Kreisel) Nooderl.	*Stropharia caerulea* Kreisel	Strophariaceae
Psilocybe capnoides (Fr.) Noordel.	*Hypholoma capnoides* (Fr.) P.Kumm.	Strophariaceae
Psilocybe coprophila (Fr.) Noordel.	*Deconica coprophila* (Bull.) P.Karst.	Strophariaceae
Psilocybe coronilla (Bull.) Noordel.	*Stropharia coronilla* (Bull.) Quél.	Strophariaceae
Psilocybe cyanescens Wakef.	Binomial confirmed	Hymenogastraceae
Psilocybe elongata (Pers.) J.E.Lange	*Hypholoma elongatum* (Pers.) Ricken	Strophariaceae
Psilocybe ericacea (Pers.) Quél.	Nomen nudum	–
Psilocybe ericaeoides (P.D.Orton) Noordel.	*Hypholoma ericaeoides* P.D.Orton	Strophariaceae
Psilocybe fascicularis (Huds.) Noordel.	*Hypholoma fasciculare* (Huds.) P.Kumm.	Strophariaceae
Psilocybe fascicularis var. *pusilla* (J.E.Lange) Noordel.	*Hypholoma fasciculare* (Huds.) P.Kumm.	Strophariaceae
Psilocybe halophila (Pacioni) Noordel.	*Stropharia halophila* Pacioni	Strophariaceae
Psilocybe hornemannii (Fr.) Noordel.	*Stropharia hornemannii* (Fr.) S.Lundell & Nannf.	Strophariaceae
Psilocybe inquilina (Fr.) Bres.	*Deconica inquilina* (Fr.) Pat. ex Romagn.	Strophariaceae
Psilocybe inquilina var. *crobula* (Fr.) Hoiland	*Deconica crobula* (Fr.) Romagn.	Strophariaceae
Psilocybe inuncta (Fr.) Noordel.	*Stropharia inuncta* (Fr.) Quél.	Strophariaceae
Psilocybe luteonitens (Fr.) Park-Rhodes	*Protostropharia luteonitens* (Fr.) Redhead	Strophariaceae
Psilocybe marginata (Pers.) Noordel.	*Hypholoma marginatum* J.Schröt.	Strophariaceae
Psilocybe melanosperma (Pers.) Noordel.	*Stropharia melanosperma* (Bull.) Gillet	Strophariaceae
Psilocybe merdaria (Fr.) Ricken	*Deconica merdaria* (Fr.) Noordel.	Strophariaceae
Psilocybe montana (Pers.) P.Kumm.	*Deconica montana* (Pers.) P.D.Orton	Strophariaceae
Psilocybe phyllogena (Sacc.) Peck	*Deconica phyllogena* (Sacc.) Noordel.	Strophariaceae
Psilocybe polytrichi (Fr.) Sacc.	*Hypholoma polytrichi* (Fr.) Ricken	Strophariaceae
Psilocybe pratensis P.D.Orton	*Deconica pratensis* (P.D.Orton) Noordel.	Strophariaceae
Psilocybe pseudocyanea (Desm.) Noordel.	*Stropharia pseudocyanea* (Desm.) Morgan	Strophariaceae
Psilocybe radicosa (J.E.Lange) Noordel.	*Hypholoma radicosum* J.E.Lange	Strophariaceae
Psilocybe rugosoannulata (Farl. ex Murrill) Noordel.	*Stropharia rugosoannulata* Farl. ex Murrill	Strophariaceae
Psilocybe semiglobata (Batsch) Noordel.	*Protostropharia semiglobata* (Batsch) Redhead, Moncalvo & Vilgalys	Strophariaceae
Psilocybe semilanceata (Fr.) P.Kumm.	Binomial confirmed	Hymenogastraceae
Psilocybe semistriata (Peck) Guzmán	Binomial confirmed	Hymenogastraceae
Psilocybe squamosa (Pers.) P.D.Orton	*Leratiomyces squamosus* (Pers.) Bridge & Spooner	Strophariaceae
Psilocybe squamosa var. *thrausta* (Kalchbr.) Guzmán	*Leratiomyces squamosus* (Pers.) Bridge & Spooner	Strophariaceae
Psilocybe subcoprophila (Britzelm.) Sacc.	Binomial confirmed	Hymenogastraceae
Psilocybe subericaea (Fr.) Sacc.	*Hypholoma subericaeum* (Fr.) Kühner	Strophariaceae
Psilocybe subviscida (Peck) Kauffman	Binomial confirmed	Hymenogastraceae
Psilocybe subviscida var. *velata* Noordel. & Verduin	*Psilocybe subviscida* (Peck) Kauffman	Hymenogastraceae
Psilocybe turficola J.Favre	Binomial confirmed	Hymenogastraceae
Psilocybe uda (Pers.) Gillet	*Bogbodia uda* (Pers.) Redhead	Strophariaceae

The nomenclatural update, referred to Index Fungorum (https://www.indexfungorum.org/names/names.asp) as of November 2025, has led to a drastic reduction in the number of taxa actually attributed to the genus *Psilocybe*, as ten taxa have been transferred to *Stropharia* (Fr.) Quél., nine taxa to *Hypholoma* (Fr.) P.Kumm., seven taxa to *Deconica* (W.G.Sm.) P.Karst., two taxa to *Protostropharia* Redhead, Moncalvo & Vilgalys, two taxa to *Leratiomyces* Bresinsky & Manfr. Binder ex Bridge, Spooner, Beever & D.C.Park, and one taxon to *Bogbodia* Redhead. *Psilocybe ericacea* (Pers.) Quél. is considered a nomen nudum, probably confused with *P. semilanceata* or *P. cubensis*. The total number of taxa of the genus *Psilocybe* in Italy is currently nine (Table 2), since *P. medullosa* (Guzmán 2005) and *P. serbica*, recorded during the activities of the NDM, should be added to the seven confirmed taxa reported in Table 1.

Distribution and ecology of *Psilocybe* taxa in Italy

As with other critical fungal groups, the distribution of *Psilocybe* species is also affected by the limited exploration of certain territories and the small number of experienced mycologists working in Italy. Currently, the distribution of some species is restricted to a single region, as in the case of *Psilocybe medullosa* and *P. semistriata* (Trentino-Alto Adige/Südtirol), *P. serbica* (Calabria), *P. subviscida* (Emilia Romagna), and *P. turficola* (Veneto). *P. subcoprophila* is recorded for Emilia-Romagna and Trentino-Alto Adige/Südtirol while *P. semilanceata* is distributed in central and northern administrative regions of Italy. Two species, *i.e. P. aurantiaca* and *P. cyanescens*, are also distributed in the islands of Sardegna and Sicilia (Table 2). Some *Psilocybe* species are found, solitary or in group, on dead wood within coniferous and deciduous forests but most are observed in meadows and pastures rich in organic matter mainly of animal origin. In particular, *P. aurantiaca* and *P. serbica* are usually found in meadows and on wood chips, *P. cyanescens* grows on decaying woody material (chips, bark, mulch),

Table 2. List of *Psilocybe* taxa occurring in Italy with indications of family, distribution and ecological category. Administrative region: CAL = Calabria; EMR = Emilia-Romagna; LIG = Liguria; LOM = Lombardia; SAR = Sardegna; SIC = Sicilia, TAA = Trentino-Alto Adige/Südtirol; TOS = Toscana; VEN = Veneto. Ecological categories: Sd = Saprotroph on dung, Sm = Saprotroph on mosses, St = Terricolous saprotroph, Sw = Saprotroph on wood. The regional distribution is the result of a combination between the data reported by Onofri et al. (2005) and our recent personal investigation (*).

Taxon	Region	Ecological categories
Psilocybe aurantiaca (Cooke) Noordel.	EMR, LOM, SIC, TOS	Sw/St
Psilocybe cyanescens Wakef.	CAL, EMR, LIG, SAR, SIC, TAA	Sw
Psilocybe medullosa (Bres.) Borov.	TAA*	Sm
Psilocybe semilanceata (Fr.) P.Kumm.	EMR, LIG, TAA, VEN	St/Sd
Psilocybe semistriata (Peck) Guzmán	TAA	St
Psilocybe serbica M.M.Moser & E.Horak	CAL*	Sw/St
Psilocybe subcoprophila (Britzelm.) Sacc.	EMR, TAA	Sd
Psilocybe subviscida (Peck) Kauffman	EMRl	Sm
Psilocybe turficola J.Favre	VEN	Sd/St

P. semilanceata and *P. turficola* grows on grass roots and on dung, *P. subcoprophila* was collected only on dung, *P. semistriata* was found in meadows while *P. medullosa* and *P. subviscida* on mosses.

Macro-and micro-morphological characters of *Psilocybe* taxa in Italy

Psilocybe aurantiaca

Pileus 3–5 cm, bright red to orange, convex to plane, cuticle usually dry, slightly viscid when moist. Flesh thin, ochre-colored, without any particular smell or taste. Lamellae, adnexed to adnate, notched, white to pale grey, then darker purple/brown or purplish grey with whitish edges. Stipe whitish, often with dark orange stains around the base, turns a deep red color when rubbed, 3–8 × 0.5–1 cm, equal to slightly larger at the base, mycelium residues attached. White partial veil remnants at first, as a thin, fragile ring. Stipe surface smooth above the ring and fluffy with tiny scales below, which often wash off with rain. Basidia tetrasporic, 12–14 × 6.5–8.5 µm. Basidiospores in deposit dark purple-brown, elliptical and smooth, with visible germinative pore, 10–13.5 × 6–8.5 µm. Pileipellis consisting of parallel hyphae and fíbulas. Cheilocystidia, 15–25 × 4–8 µm on the edges and on the faces of the gills, elongated, cylindrical, sinuous, with ends sometimes slightly enlarged, sometimes diverticulated. Pleurocystidia fusoid-ventricose, to sublageniform, 17.5–25 × 4.6–10 µm.

Psilocybe cyanescens

Pileus 1.5–5 cm, convex at first, then flat with a wavy margin when mature. Cuticle slimy when moist, caramel-colored, lighting as it dries, turning blue when rubbed. Flesh solid and white, changes color when rubbed or cut. Mealy smell and taste. Lamellae dense, adnate or slightly decurrent, cream at first, then dark purple. Stipe 3–11 × 0.2–0.7 cm, thin, whitish with a tendency to turn blue where rubbed. Basidia tetrasporic, rarely 2-spored, 20–30 × 7–10.5 µm. Basidiospores in deposit dark purplish brown, ellipsoidal and smooth, oblong to oval, 9–12 × 5–9 µm, with distinct broad germ pore. Pileipellis with a surface layer of ixocute clearly visible even at low magnifications. Cheilocystidia, 15–30 × 4–7 µm, sublageniform to fusoid-ventricose, cylindric at base with extended singly or split neck, 6 × 1.5–3.5 µm. Pleurocystidia, 17–33 × 5–9 µm, fusoid-ventricose to subpyriform, sometimes mucronate, more common near gill edges.

Psilocybe medullosa

Pileus 1–2 cm, striated margin, obtusely conical to campanulate, orangish-brown to brown with a lighter margin, slimy cuticle that cannot be separated, not distinctly hygrophanous but fading when mature, veil not very evident at first, fleeting (Fig. 1). Flesh with a more or less faint horseradish smell. Lamellae moderately broad, with lamellulae, slightly ascending, adnate, dull brown to rusty in color, gill margin white. Stipe 5–8 × 0.2–0.3 cm, central, cylindrical, hollow, slightly sinuous, light brownish

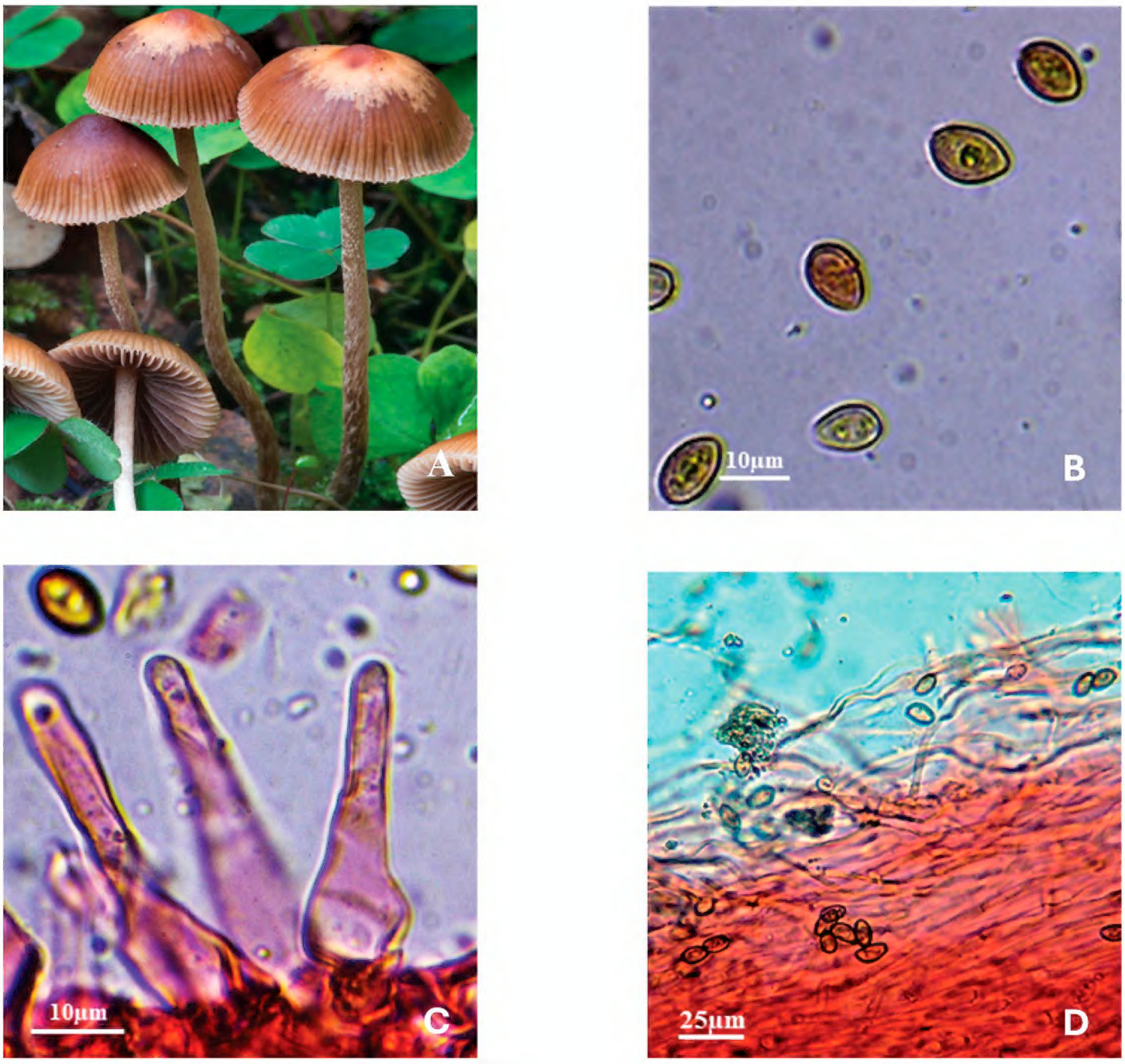

Figure 1. *Psilocybe medullosa*, recently collected in a conifer forest in the Paneveggio Pale di S. Martino Regional Park (province of Trento, Trentino Alto Adige/Südtirol). **A** Basidiomes **B** Basidiospores **C** Cheilocystidia **D** Pileipellis. Magnification 40×. Scale bar: 1 mm.

with a lighter apex, covered with white fibrils in the lower part, whitish mycelium at the base, partial veil whitish, thin, cortinate. Basidia tetrasporic, brownish, clavate, 20–25 × 6.5–7.5 µm Basidiospores in deposit ellipsoidal-oblong, smooth, with slightly thickened walls and small distinct pores, dark-purplish brown, 8–11 × 4.5–5.5 µm. Pileipellis ixotrichoderm, consisting of a thin layer of loosely interwoven, gelatinised hyphae. Cheilocystidia numerous, 25–40 × 8–9(12) µm, lageniform with generally narrow and long necks, straight or sinuous. Pleurocystidia absent.

Psilocybe semilanceata

Pileus 0.5–2.5 cm, light brown, beige, translucent when wet, pronounced central protuberance, shaped like a small cone. Cuticle covered with a separable, smooth, hygrophane gelatinous layer, initially greenish brown, becoming cream-ochre in dry weather. Flesh

thin and membranous, white, farinaceous odor and taste, turn blue where rubbed. Lamellae tending towards reddish brown or gray, adnate or subdecurrent to the stipe, dense and narrow, with a margin that is often lighter in color, becoming almost black due to spore release in ripe basidiomata. Stipe 3–10 × 0.3–0.75 cm, very thin, up to 1–2 mm, whitish or light brown. Basidia clavate, with a slight central constriction, tetrasporic, more rarely bisporic, 24.5–32.7 × 8.6–11.2 µm Basidiospores dark purplish-brown in deposit, ellipsoid, 10.5–15 × 6.5–8.5 µm. Pileipellis arranged in a 100–130 µm thick ixocutis, formed by septate hyphae, with a diameter of 2.2–5.5 µm, smooth or finely encrusted, immersed in a hyaline gel. Cheilocystidia lageniform to cylindrical, with an extended and flexuous neck, often forked, 20–5 × 5–10 µm. Pleurocystidia absent.

Psilocybe semistriata

Pileus 0.5–2.5 cm, convex to subumbonate, smooth, glabrous, hygrophanous, dark brown to light yellowish brown. Flesh thin and membranous, white, farinaceous odor and taste. Lamellae adnate to slightly decurrent, purplish brown, with whitish edges. Stipe 5–10 × 0.3–0.75 cm, light brown to dark brown or reddish brown, without veil remnants. Basidia clavate, tetrasporic, 22.5–30.7 × 8.5–11.5 µm. Basidiospores dark purplish brown in deposit, 8–11 × 5.5–6.5 µm, ellipsoid, thick walled, yellowish-brown, with a broad germ pore. Pileipellis is arranged in a thick ixocutis, smooth or finely encrusted, immersed in a hyaline gel. Cheilocystidia 20–30 × 5.5–6.5 µm, hyaline, frequently agglutinated in a gelatinous mass, sublageniform, sometimes with a flexuous neck. Pleurocystidia absent or very rare, when present 23 × 5 µm, subfusoid.

Psilocybe serbica

Pileus 1–4 cm, smooth, hygrophanous, slightly translucent-striate when moist but not viscid, buff-brown to orangish-brown, pale ochraceous when dry, conical to campanulate or convex, in ripe basidiomata broadly convex or plane and incurved at first then plane or decurved (Fig. 2). Flesh whitish to cream-colored, bruising blue when rubbed, smell raddish, but never farinaceous, taste usually bitter. Lamellae adnate to adnexed, often subdecurrent, light brown then dark brown with a purple tint, the edges remaining paler. Stipe, 4.0–8.0 × 0.15–0.8 cm thick, slightly enlarged at the base, whitish with a silky gloss and glabrous, or with some whitish remnants of the fibrillose veil. Basidia tetrasporic, claviform, 21.5–28.7 × 6.5–10.5 µm. Basidiospores dark purplish brown in deposit, tending toward dark purple, 10–13 × 6–7.5 µm, purple-brown, ellipsoid, slightly flattened, and thick-walled, with a distinct germ pore. Pileipellis as an ixocutis with cylindrical, slightly intertwined hyphae. Cheilocystidia, 20–35 × 6.0–11 µm, lageniform, tapering necks. Pleurocystidia absent.

Psilocybe subcoprophila

Pileus 1–3 cm, hemispherical to-conical then convex, cuticle hygrophanous, gelatinous, peelable, dark red-brown when moist, beige-brown when dry, margin acute with

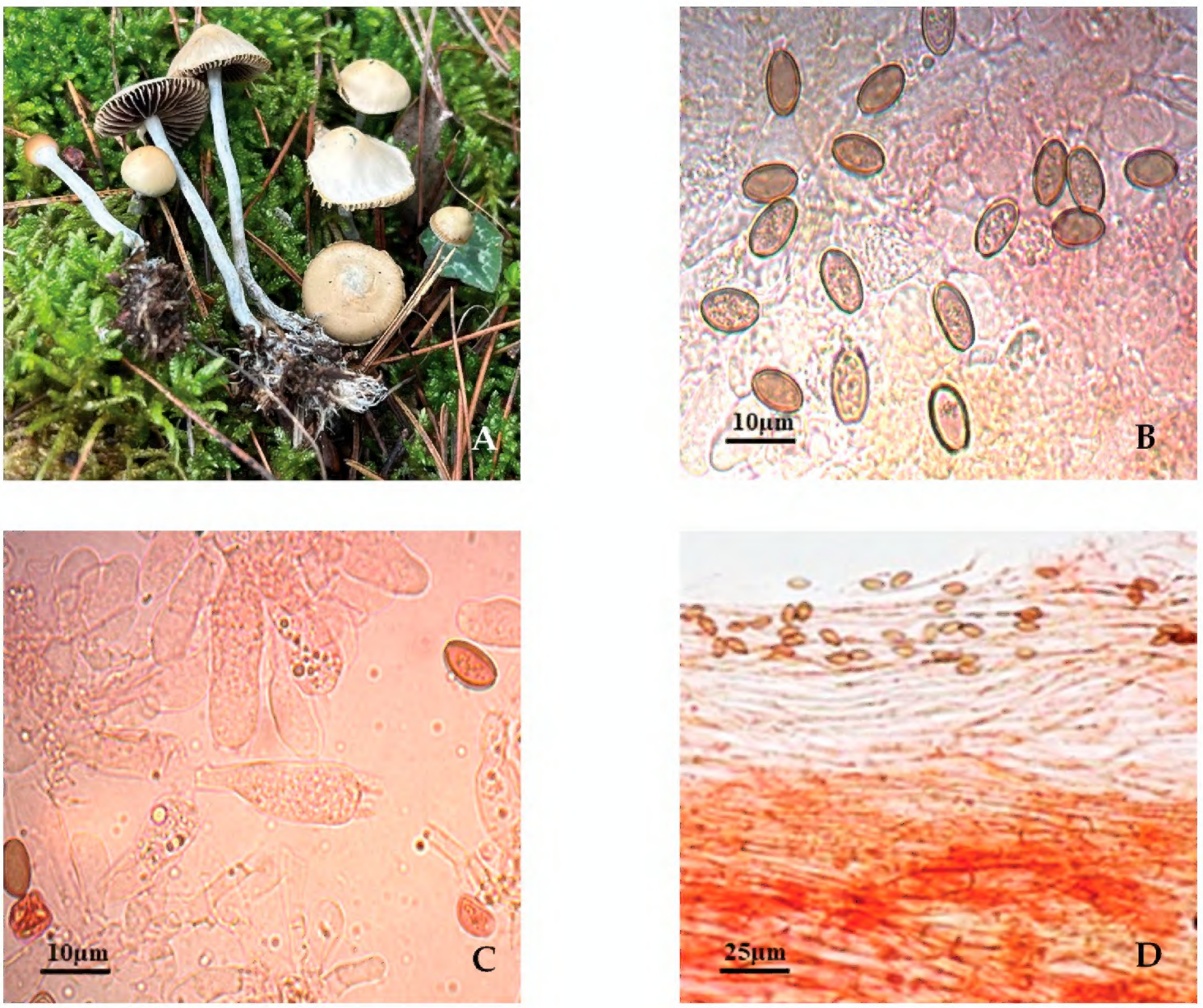

Figure 2. *Psilocybe serbica*, recently collected in a conifer forest in the Sila National Park (province of Cosenza, Calabria, southern Italy). **A** Basidiomes **B** Basidiospores **C** Cheilocystidia **D** Pileipellis. Magnification 40×. Scale bar: 1 mm.

whitish veil remnants at first, Flesh gray to reddish-brown, thin, fungus-like smell and taste. Lamellae light brown then dark violet-brown, broadly adnate and with a decurrent tooth, edges slightly floccose. Stipe 2.0–5.0 × 0.1–0.3 cm, cylindrical, often bent, solid then hollow, white fibrillose or pruinose on a gray-brown background, white-tomentose at the base. Basidia tetrasporic, clavate or obovate, 18–26 × 5.5–8 µm. Basidiospores dark purplish brown in deposit, 16–21 × 9.6–12 µm, elliptical, smooth, dark brown, thick-walled, germ pore present. Pileipellis as an ixocutis with cylindrical, slightly intertwined hyphae. Cheilocystidia sub-lageniform, somewhat flexible, 35–50 × 8–10 µm. Pleurocystidia absent.

Psilocybe subviscida

Pileus 0.5–2.5 cm, hygrophanous, convex then flattened, with a slimy, greasy, shiny surface, warm brown to brown, much darker at first then lighter, cuticle separable. Margin slightly involute with evanescent veil residues, also scattered on other parts

on the pileus. Flesh brownish yellow with a mealy taste and a neutral, indistinct odor. Lamellae moderately sparse, broad, anastomosed, adnate or hooked, purple-brown, ochre-rusty to reddish-brown towards the stipe. Stipe 1.2–2.3 × 0.1–2.5 cm, cylindrical and flexible, widened at the base, cottony, darker at the bottom, with a vague annular zone highlighted by fallen spores, which quickly disappears. Basidia tetrasporic 28–40 × 6–9 µm. Basidiospores dark brown in deposit, 6.5–7.5 × 4.0–4.5 µm, ellipsoidal, oblong and flattened, ovoid, mitre-shaped, pore evident and central. Pileipellis as an ixocutis of cylindrical, thin hyphae, wide, smooth, embedded in a gelatinous layer. Cheilocystidia, 20–55 × 4–6.5 µm, lageniform with long, narrow, often obtuse but also more acute necks, occupying a large part of the lamellar edge. Pleurocystidia are absent.

Psilocybe turficola

Cap 2–6 cm, bell shaped, reddish-brown, glabrous, smooth, somewhat striate, spongy if dry. Lamellae ascending ventricose and broadly adnate, beige, free, forking, very fine. Flesh thin with strong smell. Stipe 6.0–10.0 × 0.3–0.6 cm, light brown, sometimes, especially at the base, bluish green, almost smooth to fibrillose-squamulose, often with partial veil residue, hollow, the inside is lined with a spongy tissue. Basidia clavate, tetrasporic, 20.5–27.7 × 8.5–11.5 µm. Basidiospores dark purplish brown in deposit, sub ellipsoid, 9.0–14.0 × 5–9 µm. Pileipellis is arranged in a thick ixocutis, smooth or finely encrusted, immersed in a hyaline gel. Cheilocystidia, 18–36 × 4.0–7.0 µm, lageniform to ventricose with a tapering neck. Pleurocystidia are absent.

Molecular analysis

The results of the molecular analysis are consistent with those reported in the literature and confirm that *P. semilanceata* is the representative type species within the genus *Psilocybe*. The neighbour-joining tree based on the ITS1-5.8S rDNA-ITS2 sequences of *Psilocybe* sp. pl. (Fig. 3) encompasses all the psilocybin-active taxa growing in the Italian territory. In Fig. 3 the names of *Psilocybe* species are reported as deposited in GenBank (https://blast.ncbi.nlm.nih.gov), such as *P. fuscofulva*, *Leratiomyces ceres*, and *Deconica semistriata*, as reported in Index Fungorum, with the scientific binomials of *P. turficola*, *P. aurantiaca*, and *P. semistriata*, respectively.

Discussion

The taxonomy, distribution, and ecology of taxa belonging to the genus *Psilocybe* in Italy require in-depth study, given that the available data are fragmentary and the literature is rather sparse. The *Psilocybe* taxa reported in this survey are also largely present in other European and non-European countries. As already noted for other genera, fungi growing in the Mediterranean area (Kauserud et al. 2008) show some differences in the size of the parts of the basidioma and also in their microscopic characteristics, which

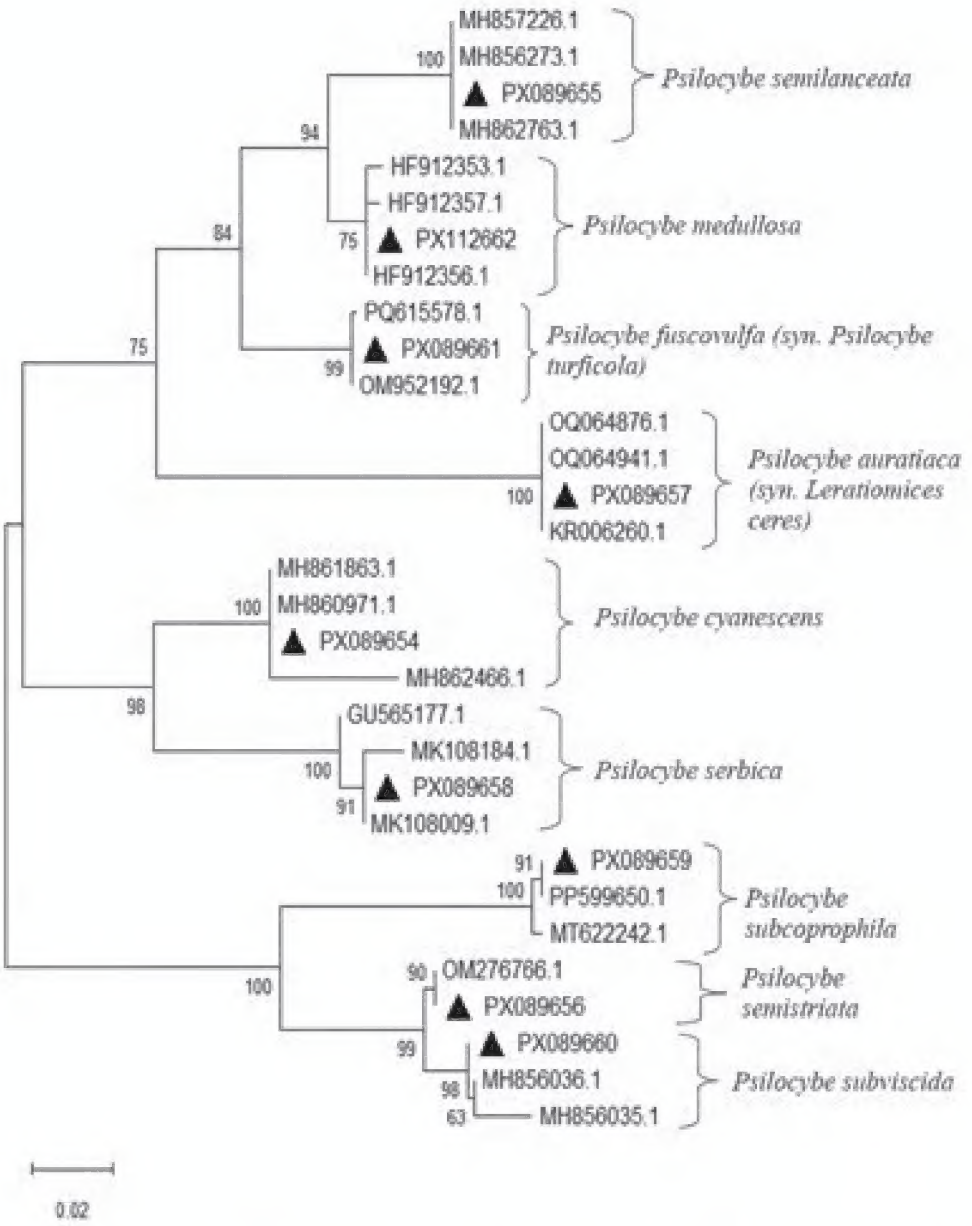

Figure 3. Neighbour-joining tree based on ITS sequences obtained using the Maximum Likelihood method and the Tamura-Nei model. Black triangle indicates the isolates obtained during this study. Bootstrap tests were performed with 1,000 replications.

are smaller in size due to the climatic conditions often characterized by long periods of drought. Another difference is represented by the habitats in which *Psilocybe* species are found in Italy. In fact, while the literature reports fairly diverse habitats (Strauss et al. 2022) and, in particular, that many species of *Psilocybe* are found in riparian forests and flooded rivers, the species surveyed so far in Italy prefer dead wood within coniferous and deciduous forests, but most of them have also been observed in meadows and pastures rich in organic matter of mainly animal origin. Finally, according to literature data (Strauss et al. 2022; Stamets 2025), the content of psilocybin and psilocin in the taxa reported from Italy is high in *P. cyanescens* (2.5 % by dry weight of psilocybin and 1.2% by dry weight of psilocin), *P. semilanceata* (0.33–1.57% by dry weight of psilocybin and 0.1–0.38% by dry weight of psilocin), and *P. serbica* (0.15–1.% by dry weight of psilocybin and 0.004%–0.249% by dry weight of psilocin), while minimal levels of psilocybin and psilocin are found in *P. turficola*.

Conclusions

The widespread availability of *Psilocybe* mushrooms in Italy, both in forest ecosystems and in meadows and pastures, provides the groundwork for new research into their potential applications across various domains. These include psychedelic-assisted psychotherapy (Schenberg 2018), clinical research (Swieczkowski et al. 2025), end-of-life care (Unsworth et al. 2025), neurodegenerative diseases such as Amyotrophic Lateral Sclerosis (ALS) (Gold et al. 2023), and chronic, debilitating neurological conditions with limited treatment options, such as persistent post-concussion symptoms (Lawrence 2025), and functional neurological disorders (Butler 2020). We hope that Italy will soon legalize the use of psychedelic mushrooms in clinical therapies, following the examples of countries like the United States, the United Kingdom, Switzerland, and Australia, also allowing free scientific investigation into the potential applications of this group of species belonging to the genus *Psilocybe*.

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